GLY 4310C
LAB EXERCISE 2 SILICATES: PART 2

CLASS : SILICATES

SUBCLASS:INOSILICATES continued

AMPHIBOLE GROUP - The structure of this group consists of double chains of tetrahedra running parallel to the crystallographic **z** axis. Like the pyroxenes both orthorhombic and monoclinic symmetry is possible. The only common orthoamphibole is anthophyllite. All of the others are clinoamphiboles. Amphiboles are hydrous minerals.

Anthophyllite - $(Mg,Fe)_7Si_8O_{22}(OH)_2$

TREMOLITE - $Ca_2Mg_5Si_8O_{22}(OH)_2$ Also occurs as variety hexagonite.

ACTINOLITE - $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$

Tremolite and actinolite form a solid solution series. As the iron content increases the color of the mineral changes from white to progressively darker green.

HORNBLENDE - $(Ca,Na)_{2-3}(Mg,Fe,Al)_5Si_6(Si,Al)_2O_{22}(OH)_2$

Most common and most important amphibole.

Glaucophane - $Na_2Mg_3Al_2Si_8O_{22}(OH)_2$

Riebeckite - $Na_2Fe^{3+}Fe^{3+}_2Si_8O_{22}(OH)_2$

SUBCLASS:PHYLLOSILICATES

The word *phyllon* means leaf in Greek. Most minerals in this group have one cleavage direction (basal cleavage) and exhibit a platy or flaky habit. Most are flexible and some are elastic. The structure is a sheet or layer like arrangement of silicon tetrahedra which share three corners. The Si:O ratio is 2:5. The SiO_4 layers are tetrahedral or t-layers. If the cations are divalent all cation positions are filled; the structure is trioctahedral. If the cations are trivalent, only two-thirds of the cation sites are occupied; the structure is dioctahedral. Diphormic phyllosilicates consist of one t-layer joined to one o-layer. The o-layer consists of non-Si cations in octahedral coordination. Triphormic phyllosilicates consist of one o-layer and two t-layers (t-o-t). Tetraphormic phyllosilicates consist of t-o-t sandwiches held together by o-layers.

The minerals are hydrous. Many of these minerals are weathering products but they may also be primary minerals formed directly from magma and as a result of metamorphism. The mica and clay mineral groups are the most important but the serpentine and chlorite group also contain common minerals.

SERPENTINE GROUP - These minerals are generally the weathering products of ultramafic stocks. Antigorite and chrysotile are dimorphous. Antigorite has a platy habit. Chrysotile is the chief source of asbestos. Garnierite is a Ni-ore, formed by the weathering of Ni-rich peridotites. These minerals are diphormic trioctahedral phyllosilicates.

ANTIGORITE - $Mg_3Si_2O_5(OH)_4$

CHRYSOTILE - $Mg_3Si_2O_5(OH)_4$

Garnierite - $(Ni,Mg)_3Si_2O_5(OH)_4$ REFERENCE sample -DO NOT TEST!

CLAY MINERAL GROUP - Clay refers to a very small particle size. Clays become plastic when mixed with small quantities of water. They are composed of a number of minerals known collectively as clay minerals. These are weathering products and are hydrous aluminosilicates.

KAOLINITE - $Al_2Si_2O_5(OH)_4$	Diphormic, dioctahedral
Pyrophyllite - $Al_2Si_4O_{10}(OH)_2$	Triphormic, dioctahedral
TALC - $Mg_3Si_4O_{10}(OH)_2$	Triphormic, trioctahedral

MICA GROUP - The micas are triphormic phyllosilicates and contain several of the most readily recognized minerals. The crystals are usually tabular with pronounced basal cleavage. The minerals have monoclinic symmetry but β is nearly equal to 90° and they appear to be either hexagonal or orthorhombic. There is limited solid solution between members of the group. It is possible for two members of the group to crystallize together in a parallel position, with cleavage extending through both.

MUSCOVITE - $KAl_2(AlSi_3O_{10})(OH)_2$ Dioctahedral

Phlogopite - $KMg_3(AlSi_3O_{10})(OH)_2$ Trioctahedral

BIOTITE - $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ Trioctahedral

LEPIDOLITE - $K(Li,Al)_{2-3}(AlSi_3O_{10})(O,OH,F)_2$ Di- or trioctahedral

Vermiculite - $(Mg,Fe^{2+},Al)_3(Al,Si)_4O_{10}(OH)_2.4H_2O$

CHLORITE GROUP - These minerals closely resemble each other. It is usually necessary to do quantitative chemical analysis, or careful optical and X-Ray studies to distinguish individual species. They are tetraphormic.

CHLORITE - $(Mg,Fe)_3(Si,Al)_4O_{10}(OH)_2.(Mg,Fe)_3(OH)_6$
Di- or trioctahderal. Prochlorite is similar.

PREHNITE - $Ca_2Al(AlSi_3O_{10})(OH)_2$

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